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FORTHCOMING MEETINGS

MONDAY, 30TH APRIL, at 6 p.m. The last of three CANTOR LECTURES on '*Modern Welding*', by H. G. Taylor, D.Sc., M.I.E.E., F.Inst.P., Director, British Welding Research Association. (The syllabus for these lectures was published in the *Journal* for 30th March.)

WEDNESDAY, 2ND MAY, at 2.30 p.m. '*Beauty in Danger—the Urban Scene*', by Sir Hugh Casson, M.A., F.R.I.B.A., R.D.I., Professor of Interior Design, Royal College of Art. The Right Honble. The Earl of Euston, M.A., F.S.A., Deputy Chairman, Society for the Protection of Ancient Buildings, and Member, Historic Buildings Council for England, will preside.

MONDAY, 7TH MAY, at 6 p.m. The first of three CANTOR LECTURES on '*Some Recent Studies of Sociology*', entitled '*Class Conflict and Social Mobility*', by T. S. Simey, M.A., Charles Booth Professor of Social Science, University of Liverpool.

WEDNESDAY, 9TH MAY, at 2.30 p.m. '*Automation*', by the Right Honble. The Earl of Halsbury, F.R.I.C., F.Inst.P., Managing Director, National Research Development Corporation, a Member of Council of the Society. The Right Honble. Lord Latham, J.P., F.A.C.C.A., F.C.I.S., a Member of Council of the Society, will preside.

MONDAY, 14TH MAY, at 6 p.m. The second of three CANTOR LECTURES on '*Some Recent Studies of Sociology*', entitled '*Some Aspects of the Development of Demography*', by David V. Glass, B.Sc.(Econ.), Ph.D., Professor of Sociology, University of London at the London School of Economics.

WEDNESDAY, 16TH MAY, at 2.30 p.m. PETER LE NEVE FOSTER LECTURE. '*Electronic Photography*', by C. G. Mayer, O.B.E., M.I.E.E., of the Radio Corporation of America. Sir Harold Bishop, C.B.E., F.C.G.I., M.I.E.E., M.I.Mech.E., Director of Technical Services, British Broadcasting Corporation, will preside.

Fellows are entitled to attend any of the Society's meetings without tickets (except where otherwise stated), and may also bring two guests. When they cannot accompany their guests, Fellows may give them special passes, books of which can be obtained on application to the Secretary.

FACULTY OF ROYAL DESIGNERS FOR INDUSTRY

The Faculty of Royal Designers for Industry held a luncheon at Kettner's Restaurant on Wednesday, 11th April, in honour of Sir William Lyons, R.D.I., who received his Knighthood in the New Year Honours, and Mr. Walter Gropius, Hon.R.D.I., who was paying a brief visit to England to receive the Gold Medal of the Royal Institute of British Architects, and who had not previously had an opportunity of attending a Faculty function. He was appointed an Honorary Royal Designer for Industry in 1947.

After luncheon there was a most interesting informal discussion based on the following brief address which was made by Mr. Gropius:

> It is a great honour and pleasure for me to come finally face to face with a group of people who already years ago acknowledged my concern with the improvement of industrial design by taking me into their circle.
>
> Since my architect colleagues have now also established my name in their ranks I feel more than ever that in England, ever since the days of Ruskin and Morris, a strong sympathy exists for all those who feel responsible for the development of the incubus we have let loose on an unsuspecting world: the machine.
>
> I have only recently returned from a world-wide tour which took me to the South American, Australian and Asian continents, and if anything could have convinced me more strongly that our Western world will have to find better answers to the problems of an industrialized society it was seeing the impact of our civilization on cultures remote and alien to our ambitions, our goals. In spite of some material, hygienic and even social gains, the disadvantages of the sudden conversion were far more in evidence than the advantages, and when a customs official in Japan asked me seriously upon my entry into that country: 'Are you engaged in culture?' I felt a sudden pang of conscience about our ability to export this precious commodity to peoples who still live so much closer to the remnants of an integrated way of life and its visual manifestations than we do.
>
> As for the work I myself have done in trying to relate and reconcile the diverging and contradictory tendencies of our time, I might feel satisfied to see my own brain child, the Bauhaus-idea, become so strong and independent, writing its own history in many languages now.
>
> But it worries me that all too often only one section of its complex structure has been singled out for inspection, implementation, discussion and study, when all that *really* mattered was to see the *whole* of it, to comprehend the points of connection, of relation, of integration.
>
> I remember one sad experience in this respect which I had after the death of my friend Moholy-Nagy. I tried at that time to persuade museum and art circles to put on an exhibition of his work as a painter, a photographer, a designer, and as an educator, to show how ardently he had tried to demonstrate the necessity for integration of all those fields in his own life. Well, I got nowhere with this idea. One group was ready to show his paintings, one group wanted to exhibit his design work and another concentrated on his ideas as an educator. I found absolutely no understanding for the essential point I had wanted to make, because the different factions are still all tied strictly to their limited objectives and do not see these sufficiently as parts of a unified entity.

From this point of view Japan was a revelation to me. There, for three centuries, certain standards for building and everyday goods remained unchallenged, but they reached such a broadness of conception that infinite individual interpretations within the same standard framework were produced: there was unity in diversity, which, after all, is also our final goal for the industrialized society.

I know that the members of your group have made many creative efforts in this direction and I am very proud to belong to you.

THE BENJAMIN FRANKLIN MEDAL

Some months ago Lord Halsbury suggested to the Council that as the Albert Medal, the Society's senior award, is normally given to men who have already attained wide repute and received high distinctions and who usually, moreover, are already advanced in years, there was room for an additional award for younger men who have already made a name for themselves, although in possibly a more limited circle, and have thereby given promise that they may well have a career of further distinction ahead of them towards which a high award from the Royal Society of Arts would be a real encouragement.

This proposal has been under careful consideration by the Council and the Special Activities Committee and at the meeting of Council on 9th April the following Resolution, which has since received the approval of His Royal Highness the President, was adopted:

1. In the 200th year after the election of Benjamin Franklin to membership of the Society for the Encouragement of Arts, Manufactures and Commerce, and in pursuance of the Society's titular objects, the Council resolve to institute a new award, to be known as 'The Benjamin Franklin Medal', which shall be made annually (subject as is hereinafter provided), in the month of January, to individuals who have attained early distinction, with promise of further achievement, in the promotion of arts, manufactures and commerce.

2. Each year the Council shall at its July meeting appoint a selection committee of five members, representative jointly of arts, manufactures and commerce, which shall submit to the Council at its October meeting a name or short list of names deemed suitable for consideration for the award, with appropriate comments for the information and guidance of the Council. The Council shall then at its November meeting decide upon a name for submission to the President for his approval and the award shall formally be made by the Council at its January meeting, always provided that they may withhold the award if in their, or the President's opinion, no suitable name has been proposed. It shall be in the power of both the President and the Council to suggest any name to the committee, but no award shall be made unless the name of the proposed recipient shall have been duly considered by the committee.

3. The Council, in instituting the medal, propose, but not as a binding procedure, that the Selection Committee in drawing up their recommendations, may find it desirable to consider different specific spheres of activity by annual rotation.

PROGRAMME FOR THE 203RD SESSION

The Council will shortly be considering the programme of meetings for the forthcoming Session, and Fellows are invited to forward to the Secretary suggestions for lectures and papers by 1st June.

INSECT PHYSIOLOGY IN RELATION TO INSECTICIDES

The Fernhurst Lecture by

V. B. WIGGLESWORTH, C.B.E., M.D., F.R.S.,

Quick Professor of Biology in the University of Cambridge, Director of the Agricultural Research Council Unit of Insect Physiology, delivered to the Society on Wednesday, 25th January, 1956, with E. Holmes, M.Sc., Ph.D., Technical Director, Plant Protection Ltd., in the Chair

THE CHAIRMAN: I am honoured and pleased to have been asked to take the chair to-day, partly because I have a great regard and respect for the work of Professor Wigglesworth and his colleagues at Cambridge, but also because our relative positions here are indicative of the happy relations which now exist between technical men doing fundamental research at the Universities and those doing applied research in industry. It was not always so!

There is, of course, precedent for such an arrangement. As recently as 23rd November last, Dr. R. Holroyd, Research Director of I.C.I., took the chair here at the Royal Society of Arts for a paper on 'Research in Industry', by Dr. B. K. Blount of the Department of Scientific and Industrial Research. I gather that on that occasion there was some considerable discussion on nomenclature, and whether or not fundamental research should properly only be done in the Universities, leaving applied research only to industry and the trade associations. Dr. Holroyd went so far as to say that we in the crop protection industry must do some fundamental research ourselves. However, this particular question need not concern us unduly this afternoon since there is obviously ample work to keep us all busy.

Some of the same arguments were aired at a meeting of the Farmers' Club, on 7th of November last, when Lord Rothschild gave a stimulating paper on 'Research in Agriculture'. I mention that because Lord Rothschild is, I suppose, Professor Wigglesworth's chief so far as the A.R.C. Unit of Insect Physiology at Cambridge is concerned, and because he was talking, in part, about the translation of research results into techniques useful in agriculture—another highly controversial subject.

The following lecture was then delivered:

THE LECTURE

When the late Dr. W. W. C. Topley was appointed Secretary to the Agricultural Research Council, one of his early decisions was to convene a conference on insecticides and agriculture, the terms of reference of which were to take evidence and to make recommendations on the steps needed for the development of research in that general field. As the evidence accumulated it became apparent that the scientific study of insecticides was being impeded by our lack of knowledge of insect physiology. Among the proposals put forward in the course of the discussion was one that the Council should establish a Research Unit for the physiological study of insecticidal action; and I was invited to take charge of such a unit.

I am afraid my reply was to the effect that I was not interested. For it seemed to me that that would form too narrow a foundation on which to base the

contribution of insect physiology to agriculture. Topley's reaction was typical. He asked me to set out my idea of the sort of Unit of Insect Physiology that was required—and he then virtually returned my letter in the form of an offer of appointment.

Early in 1945 I had the opportunity to visit the United States and there I found that the same process had been going on. During the earlier war years all the obvious practical trials and experiments with existing materials seemed to have been made, and there was a strong feeling in the air that what was needed most was a better understanding of insect physiology. This has resulted, in the post-war years, in a number of appointments and a great many research grants. But I discovered in Washington that almost everyone who spoke of insect physiology was really thinking of insect toxicology. Now I am fully convinced that insect physiology has a real contribution to make to the killing of insects by means of chemicals. But insect physiology is not an applied science—it is a fundamental science; and what is holding matters up is not our failure to know just how γ-BHC kills the insect, but our lack of knowledge of the internal working of the insect as a whole.

INSECT RESPIRATION

I like to quote the example of Aristotle. It had long been known to the shepherds of Macedonia that to smear the inner surface of the garments with oil was an effective measure against body lice. Aristotle studied the matter experimentally and showed that insects are always killed if oil or butter is applied to the surface of their bodies. The reason for this was quite obscure. It was made clear by the discovery of Malpighi, about two thousand years later, that insects breathe by means of branching tracheal tubes which convey air directly to the tissues. Then, rather more than a century ago, Burmeister described the sphincters which keep the tracheal spiracles closed; and within our own time we have come to realize that this is all part of the machinery necessary to permit the insect to take in oxygen and yet to keep its loss of water by transpiration down to the minimum—and that it is the efficiency of this machinery which has made the insects such successful competitors with man for the domination of the dry land.

None of these discoveries is of immediate importance in the control of insect pests. But anyone who is thinking scientifically about killing insects takes all this knowledge for granted as part of the data of his problem. It was this method of respiration which L. O. Howard had in mind when he advocated killing mosquito larvæ by the application of a film of oil to the surface of the water. Mosquito larvæ come to the surface to breathe; if there is a film of oil they will be unable to do so. But the amount of oil that used to be applied for this purpose was something like four ounces per hundred square feet of water surface. That works out to give a uniform film about eighteen to twenty microns thick. If you put a film of that thickness on a bowl of water with mosquito larvæ in it, they come to the surface, push their spiracles through the oil and breathe the air quite happily.

Around the openings of the spiracles of mosquito larvæ there are tiny glands which produce a greasy or waxy secretion. This serves to prevent the entry of water into the tracheal system. But, of course, it favours the entry of oil; and as the larva opens its spiracles in contact with the oil film, a little of the oil runs in. Provided it is a pure oil like refined paraffin or olive oil that will not hurt the insect. Indeed some mosquito larvæ can have the entire tracheal system filled with medicinal paraffin without suffering any ill effect at all. They obtain all the oxygen they require from that in solution in the water. Mosquito larvæ are killed by oils only if these contain toxic constituents. Presumably the poisons enter through the thin walls of the final branches, particularly in the ganglia of the nervous system—but at the present time we know little enough of the permeability properties of the tracheal lining.

A somewhat similar story is to be told of some of the pests of horticulture. In the late 'twenties or early 'thirties, sprays of petroleum emulsion provided the answer to the apple capsid problem. The vulnerable stage was the egg, overwintering in the bark; it was suggested that the eggs were being suffocated by the oil. We now know that oxygen passes very readily through films of paraffin; so that any interference with respiration must be of a rather subtle kind. Actually, it had been shown by Leuckhart in 1855 that the eggs of many insects possess an elaborate respiratory system. This early work had been largely forgotten; but a few years ago Beament and I confirmed and extended it.

In such an insect as the bed-bug *Cimex*, or in *Rhodnius*, there is a ring of pores just behind the cap of the egg. These pores are filled with a protein material which is in the nature of a sponge with air in the meshes. These spongy ducts do not lead directly to the yolk but to a thin layer of similar spongy protein which lines the entire shell. If a drop of a thin oil such as kerosene is applied to the cap of the egg it rapidly displaces the air in this meshwork and spreads all round the lining of the egg, between the egg shell and the yolk. Indeed, Tuft had already measured the oxygen consumption of the egg of *Rhodnius* and had shown by calculation that if the air all entered in the region of the cap it could not diffuse sufficiently rapidly through the substance of the yolk in this elongated egg to provide the amounts of oxygen that are actually consumed; but that if oxygen diffused in a gaseous phase beneath the shell (a process which is, of course, enormously more rapid than diffusion through yolk) then diffusion inwards through the yolk could achieve the rest. Such a system, coupled with an egg covering which is highly impermeable to water, will enable the egg to breathe with a minimal loss of water. Many different modifications of this general plan are to be found in different insect eggs, including (according to preliminary observations) the egg of the red spider mites. Anyone who is thinking at all closely about killing insect eggs by means of chemicals must have this knowledge in the back of his mind.

PHYSIOLOGY AND THE ACTION OF 'AEROSOLS'

Indeed, the most obvious contribution of insect physiology to the study of insecticides is just that: it provides a detailed scientific description of the life

of the insect so that the applied entomologist can think intelligently about his problem. The starting point in the acquisition of such knowledge has often been the simple-minded approach of just looking closely into some practical procedure and seeing at what point it is disrupting the insect machine. The results not only afford the intellectual satisfaction of knowing what is happening—they often provide ideas for improving or maybe revolutionizing the practical methods.

As an example of this I should like to recall briefly the work which David and Bracey carried out on mosquito and fly sprays during the war. You may remember that before the advent of DDT the great problem in this field was to make the limited supplies of pyrethrum go as far as possible. The idea behind this investigation was that if we knew just how space sprays or 'aerosols' worked we might be able to think out improvements to make them more efficient.

It soon appeared that the large droplets in the spray mist fell down to the ground, and that the very small droplets were carried past the insect in the slip stream and had no effect. The most effective droplets in the 'aerosol' were those of intermediate diameter, in the range five to ten microns—but these minute droplets are apt to evaporate rapidly and become reduced below this optimum size. Droplets of this size, however, will not make contact with the insect unless they are in active relative movement: if 'impaction' of the droplets is to take place, either they must be driven in a stream of air, or the insect must be moving. If the mosquito remains at rest in a more or less stationary 'aerosol' cloud it is not affected: it must be in flight. When the mosquito flies, by far the most actively moving parts are the wings, and these do indeed take up by far the greater part of the spray. When the wings become laden with droplets the mosquito seems to become uncomfortable; it settles and cleans the wings with the legs conveying the droplets to all parts of the body, including the sites of entry.

Two practical suggestions come out of these simple physiological observations: (i) Even when other insecticides, such as DDT, are the main killing agents in a spray, it is advantageous to add a little pyrethrum because of the agitation and flight which it induces. (ii) It is an advantage to add a certain amount of some heavier oil to the spray so that the droplets do not become reduced too much in size by evaporation. One such oil was oil of sesame. This proved, however, to be much more effective as an adjuvant than could be accounted for by its reduction of evaporation. In the United States this was traced to the synergistic action of the sesamin in the oil—but that is another story, which is not yet complete.

THE INSECT CUTICLE

Some part of these fly sprays may enter the body of the insect by way of the respiratory system, but the greater part is probably passing through the integument. That applies to many other contact insecticides; and this fact has provided a very great stimulus to the physiological study of the insect cuticle; indeed, during the past ten or fifteen years there has been a complete revolution in our knowledge of the cuticle. We are still hoping that all this increased knowledge will some day provide the answers that the toxicologist requires. So far,

it must be admitted, the cuticle becomes more complex and diverse in its structure every year; its histology and chemistry provide endless opportunities for speculation about the entry of insecticides; but we cannot really claim to understand the laws governing this process.

One point that has been established is I think important. We used to think of the insect as covered by a layer of cells which secreted over themselves a dead, inert cuticle. But now we realize that the cuticle (except perhaps in its horniest excrescences) is a living structure. The cells send filaments of cytoplasm through its substance, which often come exceedingly close to its surface: if the insect is immersed in an oil, tiny droplets of water are quickly exuded from its surface; if the surface of the cuticle is injured in the slightest degree the cells below react as though they had been wounded.

The cuticle is composed of the mucopolysaccharide chitin. In the outer part the protein component is often tanned by quinones produced either by the oxidation of phenolic substances secreted into the cuticle, or by the oxidation of phenolic constituents of the structural proteins themselves. This process renders the substance of the cuticle much more lipophil: these hardened parts contain more or less lipoid and cholesterol.

But the interest of the student of insecticides centres particularly on the outermost layers of the cuticle—the so-called epicuticle. Microscopically this appears as a thin refractile layer, a micron or less in thickness, usually colourless or amber coloured. This layer is exceedingly important in the physiology of the insect because it is the layer responsible for waterproofing; it is also the layer perhaps primarily concerned in keeping out insecticides.

The only way in which it has been possible to gain some idea of the nature of the epicuticle has been to study its deposition when a new cuticle is being formed in preparation for the moulting of the old cuticle. It then appears as an exceedingly complex structure. Before the inner chitin and protein layers are formed the cells first lay down a thin refractile layer of lipoprotein: that is the basic component of the epicuticle. Then, shortly before the old cuticle is shed, and while the chitinous layers are being formed, tiny droplets of some semifluid substance exude from the ends of the cytoplasmic filaments and gradually run together to form a continuous sheet. This material is exceedingly active in reducing ammoniacal silver; and since the commonest constituents of living tissue with this property are phenols, it has been referred to as the 'polyphenol layer'. Very soon a waxy layer begins to appear over the so-called polyphenol layer, and by the time the old cuticle is shed it is completely covered by a thin layer of wax: the new cuticle surface is extremely hydrophobe and ammoniacal silver applied to the surface is no longer reduced because it is separated by wax from the reducing substances below. Finally, at the time of moulting or very shortly afterwards, dermal glands pour out a layer of secretion which spreads over the wax and quickly hardens to form a protective coat—the cement layer. If sections of cuticle are immersed in a wax solvent the cement layer can often be seen to become detached as the wax dissolves; but the other layers can no longer be recognized at being distinct—they may perhaps be fused one with another.

This process of cuticle formation has been observed (with modifications) in a number of widely different insects. But it refers only to the general surface of the external skeleton of the insect; there must be great differences in the special regions of the cuticle which cover the sense organs; and since these regions may be those mainly concerned in the entry of some insecticides one must not expect to deduce too much from a consideration of this standard structure. But there are some points worthy of further consideration.

There can be little doubt that the wax layer is responsible for water-proofing the insect. If it is interrupted, by abrading away the delicate cement layer by which it is covered (by gently touching the surface with fine alumina dust), the rate of loss of water is enormously increased, and the insect soon dies of desiccation. And if limited areas of the cuticle are gently abraded in this way (so that they show no microscopical injury) the entry of such insecticides as rotenone or nicotine, locally applied, is greatly increased.

That naturally raises the question whether the abrasive properties of carrier dusts are important in the practical application of insecticides. There is a little evidence that that may be so; but the researches of David and Gardiner have served to emphasize the enormous complexity of this problem. There are so many variables—the size and shape and the dust particles, their hardness and hygroscopic properties, the microscopic anatomy of the insect, its movements and behaviour in contact with the dust, and so on—that it is difficult in practice to ascribe the increased efficiency of a particular carrier to one property alone.

The toxicologist is faced with the remarkable stability and inertness of the components of the epicuticle. But in order to be laid down at all these components must be mobilized, and in the study of that mobilization we have recently learned a little more about them. In the tick *Ornithodoros*, as studied by Lees and Beament, it seems that the waxy material that is used to waterproof the egg is mobilized and solubilized by association with protein; at the moment of secretion by the gland in question the protein appears to be removed from the scene of action and the wax liberated. Wolfe has described a somewhat similar process in the formation of the wax layer on the adult blowfly. It seems that the protein-containing moulting fluid, in which the adult fly is bathed up to the time of emergence, dries on the surface of the cuticle and in this process the wax crystallizes out. That suggests the possibility that the so-called polyphenol layer may be a similar 'solution' from which the wax layer crystallizes.

Rather more exact information is available about these processes in the cockroach. This insect is waterproofed by means of a mobile grease which permeates the cement layer and is freely exposed on the surface. This material has a consistency resembling that of vaseline. But if a small quantity of it, dissolved from the surface of the cockroach, is left exposed to the air for some weeks or months, it becomes converted into a hard white wax like that of the mealworm or of *Rhodnius*. Beament has shown that that is because, among the long chain paraffins, alcohols and esters which compose the cockroach wax, there are some short chain components in the C_8 or C_9 range which serve as solvents for the long

chain waxes. It is remarkable that a mixture of octyl alcohol and octane has very special solvent properties for such a substance as beeswax, and these properties are identical with those of the distillate from fresh cockroach grease. The toxicologist, interested in rendering this insect wax unstable, may perhaps gain some lead to his ideas from these discoveries.

So far as the cement layer is concerned, this too is a highly resistant substance with fatty or waxy components in some hard matrix. When the lipoid constituents are removed, or at least when the material is treated with hot chloroform, it is found to be intensely reducing towards ammoniacal silver. In the cockroach, Beament has obtained evidence from its solubility and other properties that the cement layer is composed of a substance closely similar to shellac.

But, when all these chemical constituents of the surface layers have been considered, we come back to the point from which we started: the cytoplasm of the living cells extends close to the surface; the cells can control and repair these surface layers; and when we study the entry of chemicals we find that we are faced with a living barrier and not a merely passive structure. The more we study it the more the surface of the insect comes to resemble the surface of the living cell.

THE MODE OF ACTION OF INSECTICIDES

The problem of penetration by the insecticide is thus complicated enough; but when we come to consider the impact of the toxic substance on the living tissues after it has entered, we reach still more difficult problems. In order to convey fully the nature of these difficulties one would have to survey the whole range of insect poisons and their toxicology. That I have neither the time nor the competence to do. All I shall attempt is to remind you of a few of the general principles which have emerged in recent years and to illustrate these with a few examples.

It is always interesting to know how things work—it is that curiosity, of course, which is the spur to all worthwhile research. Over the years there have been papers on the mode of action of pyrethrum and other classic insecticides, and more recently a spate of papers on the mode of action of DDT. Then came the expected development of resistance to DDT and this has added an altogether new intensity to the interest taken in these problems. We want to know as much as possible about the metabolism of insecticides; about their breakdown or their elimination from the body—in the hope that given this knowledge we might be able to circumvent these processes of acquired resistance, by biochemical means.

The same problems arise in connection with the organic phosphorus insecticides. Problems of resistance in the insect are not yet so prominent; but we have the added problems of the high toxicity of these substances to man and the hope that with increased knowledge we might be able to find poisons of this type which are more selective in their action.

All these modern synthetic insecticides have been discovered empirically, in the course of testing long series of chemicals. But once found it is evident that they must intervene in some very special way in the chemical metabolism of the insect. If we had had sufficient prior knowledge of insect biochemistry

it should have been possible to predict the activity of these particular substances; and given sufficient knowledge we should be able to devise molecules which will disrupt the machine at whatever point we might desire. Actually it looks at the present time as though the boot will be on the other leg, and that it is the study of these insecticidal chemicals which will reveal how the physiology of the insect proceeds!

But, after all, it is well to remind ourselves that acetylcholine, for example, was a favourite tool of the pharmacologist long before it was realized that it is actually part of the machinery of the normal heart and nerves; and many years ago it was suggested that for certain purposes noradrenaline would be an improvement on adrenaline: only comparatively recently have we learned that this idea had been thought of long ago by the suprarenal gland. Perhaps in days to come we shall be familiar with some essential constituent of the nervous system which bears a striking resemblance to DDT.

The problems of insect toxicology have, indeed, much in common with those of medical chemotherapy. That again is a field which, since its original exploitation by Paul Ehrlich, has developed in the main empirically. But during the past few years chemotherapy has become increasingly rational. This change has been largely due to the development of prontosil and the sulphanilamide drugs. As is well known, it was shown by Woods that sulphanilamide derivatives exert their anti-bacterial effect by interference with the metabolism of *p*-amino benzoic acid—a bacterial metabolite closely similar in chemical constitution to sulphanilamide itself. This observation was later generalized by Fildes to provide a general theory of chemotherapy: that a chemotherapeutic agent is a substance which interferes with some essential metabolic reaction of the pathogenic micro-organism, and that such substances are to be sought among compounds which show some close chemical similarity to those normally utilized by the organism in its metabolism.

This conception is a special application of Quastel's theory of enzyme inhibition: that enzymes are inhibited by compounds that are so similar stereochemically to the normal substrates that they unite with and block the surface of the enzyme. When one pauses to reflect on these interlocking molecules one cannot help calling to mind Ehrlich's prophetic vision of the lock and key mechanism of resistance and immunity.

If we turn to the physiology of insects with these ideas in mind several examples at once catch the eye. The simple sugar mannose is said actually to be poisonous to the bee and wasp (though not to other insects), and this is attributed to the 'competitive inhibition' of some enzyme concerned in the metabolism of glucose. Hydrogen cyanide is a familar insect poison and it has long been known that it acts by interfering with the cytochrome system. As shown by Williams and his colleagues, the pupæ of the American silk moth during diapause are no longer dependent on the cyanide sensitive parts of the cytochrome system for their reduced metabolism: it is scarcely possible to poison these insects by means of cyanide. And, as everyone knows, hydrogen cyanide is no longer effective against certain strains of the red scale of citrus—because these also have modified

their respiratory metabolism and now rely chiefly upon metal-free autoxidizable enzymes, perhaps flavoprotein or perhaps (as in the diapausing silk moth) cytochrome b_5.

Another substance which blocks the synthesis of one or more components of the cytochrome system is diphtheria toxin. This is highly poisonous to the active stages of the American silk moth which are dependent on cytochrome C, but it has virtually no effect on the dormant pupæ in which cytochrome C is lacking.

Diphtheria toxin is scarcely a practical insecticide, but it serves to illustrate the kind of prediction that can be made when the requisite knowledge exists. An example which is rather closer to the possibilities of practise may be taken from the recent work of R. L. Metcalf and his colleagues. They argued as follows: it is well known that the cholinesterase enzyme system is important in the nervous activity of insects. Carbamic acid esters are well-known inhibitors of cholinesterase. They therefore synthesized examples of aromatic esters of carbamic acid with moderate lipoid solubility in the hope of favouring entry through the cuticle—and found that these did in fact act as contact insecticides. The most toxic were those which were least readily hydrolyzed and therefore might be expected to block the enzyme cholinesterase most effectively; and, finally, there was evidence that some particular steric arrangement of the molecule was required to give a good fit.

The inhibition of cholinesterase by organic phosphorus compounds is likewise attributed (for example by Metcalf) to the binding of the central phosphorus atom firmly to the surface of the esterase enzyme in such a way that it blocks the access of the normal enzyme substrate, acetylcholine. Acetylcholine therefore accumulates and the insect poisons itself with a normal constituent of its tissues.

Another phenomenon that is becoming increasingly familiar, both in human and insect toxicology, is the 'autointoxication' of organisms: presented with an unfamiliar substance they metabolize it partially with the formation of some product which sufficiently resembles a natural metabolite to cause it to 'block' some enzyme system. The classic example is the South African poison plant or 'gifblaar' (*Dichapetalum cymosum*). The poisonous substance in this plant is fluoroacetic acid. But as Peters and his colleagues have shown, fluoroacetate itself is not toxic to enzymes; it is converted by the enzymes in the tissues to a fluorotricarboxylic acid (probably fluorocitric acid) which inhibits aconitase—an essential enzyme in the tricarboxylic acid cycle. In a similar way demeton is metabolized in the plant with the formation of much more poisonous products; and in both insects and mammals it is not schradan itself which is the toxic anticholinesterase: it is first converted to the active product by the tissues themselves.

This same principle of the blocking of enzymes can be used in another way. Insects which have become resistant to DDT have developed enzyme systems by which DDT is broken down to non-toxic products. But it is possible to introduce substances which sufficiently resemble DDT to block this DDT—

dehydrochlorinase enzyme and which thus act as synergists that serve to increase the susceptibility of those insects which have become resistant—although, of course, they have no such synergistic action in ordinary susceptible insects.

It seems to be generally agreed that an enhanced capacity for detoxication is an important element in 'resistance' to insecticides. But one puzzling feature is that the resistant insect may still contain a large amount of the insecticide in the unchanged state. That has led to the suggestion that the important factor may be local detoxication at some key site.

Now many of the insecticides with which we are concerned are nerve poisons, and it is interesting to realize that the blood of the normal insect contains a nerve poison so potent that if the nerve axons are exposed to it they are unable to function.

That poison is potassium. But the entire nervous system in the insect, from the ganglia right down to the smallest nerves, is enclosed in a protective coat: a fibrous sheath or 'perilemma' and an underlying cytoplasmic sheath or 'perineurium'. As Hoyle has shown, if this sheath is punctured, so that the enclosed axons are exposed to the potassium-rich blood, they will no longer conduct nerve impulses.

It is highly probable that the exclusion of potassium by this sheath is an active process, an 'active transport' or 'secretion' for which energy will be required. It is not surprising, therefore, to find, as I have recently found, that the cytoplasm of the perineurium is exceptionally rich in enzymes: the succinic dehydrogenase—cytochrome oxidase system, esterase, and so forth. If this enzyme system can act upon our insecticides, it may well be responsible both for the protection of the sensitive axons from chlorinated insecticides by detoxication and for the local production of toxic derivatives of organophosphorus insecticides.

But there is another recent development in medical chemotherapy to which I must refer. Procedures are being devised which serve to bring about some alteration in the metabolism of the host, which is trivial so far as it is concerned, but which is disastrous for the parasite. Folic acid antagonists form one such example. Or, alternatively, dietary or therapeutic measures may bring about some change in the host which serves to increase its normal powers of resistance: diet may have a profound effect on resistance to malaria; certain surface-active compounds of high molecular weight can stimulate to a remarkable degree the natural cellular defences against the tubercle bacillus.

Have we a lead here which might be useful to the plant pathologist? There are three ways which are being exploited at the present time to render plants resistant to insects: the introduction of systemic insecticides, the breeding of resistant varieties, and the age-old cultural methods which aim at producing a plant in such a physiological state that it can withstand insect attack. The resistance of particular varieties appears often to depend upon some subtle change which leads to the insect growing or reproducing more slowly. The Colorado potato beetle which thrives so well on the ordinary potato *Solanum tuberosum*, appears to feed quite happily on the closely related *Solanum demissum* but it grows more slowly and is hardly able to reproduce. The same thing can be

seen in a single plant under different physiological conditions. As Kennedy and Booth have shown, young shoots or wilting leaves of beans are much the more favourable for aphides—because they are the richest in nitrogenous compounds in process of mobilization.

Could we aim at inducing such chemical changes in the plant by chemical means? So that by applying some harmless chemical to the plant its metabolism may be so affected that while it will remain unchanged so far as man's requirements go, it may become ill-suited as a host for the insect pest. That would indeed be a beneficent sphere of activity in which the chemist might still further display his talents.

DISCUSSION

MR. J. H. STAPLEY: I was interested in Professor Wigglesworth's reference to the killing of capsid eggs—naturally a subject very near to our activities, but I thought he oversimplified it by saying that it was due to the way the oil blocked the entry of air. The problem as it came to us twenty years ago was that one type of oil, that is mineral oil, apparently killed the eggs, but tar oil, which is also used for killing insect eggs, did not affect the capsid eggs. It seems rather odd that if the mechanism is a physical one like the oil blocking its cells, it should fit one type of oil and not another. I wonder if there is a lot more to the explanation than that?

THE LECTURER: I am sure that Mr. Stapley is right, and there is a great deal more to the explanation than that, but of course some of the eggs in which tar oils were most effective were ones which have a very much more permeable shell and do not have an elaborate respiratory system of this kind, so I think there is information here which serves as a very useful background for thought, although I entirely agree with him that this is not the complete explanation.

MR. W. H. POTTS: Professor Wigglesworth's reference to the insects which did not rely upon the usual enzyme system for oxidation and were therefore not destroyed by hydrogen cyanide gas, reminds me of an experience a colleague of mine, Dr. E. Burtt, had in East Africa when he was studying colour changes of acridids in that area, which take place seasonally. He found that he could bring about these colour changes from green to black by exposing the grasshoppers to insolation against a dark background, or under dark conditions, and those which darkened were impervious to the ordinary killing bottle of hydrogen cyanide, whereas I believe they were susceptible before. Does Professor Wigglesworth know of any similar occurrence by which insects which relied on one system of oxidation could change to another?

THE LECTURER: This is a most interesting observation of Mr. Potts'. Now that Dr. Uvarov's Locust Centre has a strain of albino locusts, there might be something interesting here to look into.

MR. K. F. GOODWIN BAILEY: In his reference to the use of carriers for insecticides, Professor Wigglesworth mentioned the abrasive properties of certain dusts and that it had not been possible to observe abrasions on microscopical examination. Has he any observation to make on the possibility that it may not be the abrasive properties of a carrier but absorptive property that is operating?

THE LECTURER: The abrasion cannot be seen microscopically—that is, by just looking at the cuticle unprepared under the microscope; but that abrasion has really taken place is readily proved by immersing the insect in ammoniacal silver.

Any point where even the slightest abrasion of the surface layer has occurred is actively reduced, and the effect is proved very strikingly.

MR. K. F. GOODWIN BAILEY: Is there any information about absorptive properties of carriers in relation to their toxicity to insects?

THE LECTURER: I take it that you mean in dehydrating the insect. I think that certainly does play a part. The work of David and others has shown that the hygroscopic properties of the dust are important.

THE CHAIRMAN: On that particular point I was under the impression that ground diamond was the most efficient. I cannot imagine that ground diamond is very absorbent.

THE LECTURER: Aluminar is certainly absorbent.

MR. J. R. BUSVINE: I was very interested in the point about calcium and potassium balance in nerve sheath. Is it true that if potassium salts can be injected underneath this neurilemma effects such as those obtained with D.D.T. result? I presume it could not be done with intact insects, but only by observations on action potentials in nerve preparations. It would seem that D.D.T. poisons this membrane to prevent it holding the potassium out.

THE LECTURER: I did not get quite so far as to suggest that, but you could certainly suggest it. You are quite right. Hoyle showed that in the intact nerve, if he injected potassium-containing Ringer, or the blood of the insect itself, which contains too much potassium, then the nerve would not conduct. Whether the actual effect on the nerve is closely similar to the action of D.D.T. I could not say, but it is certainly a nerve poison.

The other possibility is that you might have an insecticide which paralyzed and poisoned the sheath and allowed the insect to poison itself with its own potassium. That would be quite a nice type of insecticide!

All I was suggesting was that possibly in the D.D.T. resistant insect the locally important enzyme system might be this one in the nerve sheath, detoxicating that part of the D.D.T. which would otherwise get through to the nerve.

THE CHAIRMAN: It sounds as if Dr. Busvine is making suggestions that call for experimental verification!

MR. J. WARD: Professor Wigglesworth mentioned that octyl alcohol and octane mixtures had special properties with regard to the insect wax layer. Can he amplify that at all, and tell me what properties they have towards the wax layer?

THE LECTURER: I am afraid that I have not handled these materials myself; I am quoting Dr. Beament's work. The most striking effect is that most other wax solvents will hold a certain amount of wax and that is all. But mixtures of octyl alcohol and octane will mix with wax in all proportions so that you can get a vaseline-like material. Then these solutions will spread remarkably effectively over surfaces. I think there is rather more to it than that, but those are the two most striking observations which I remember.

DR. P. A. HARLOW: I should like to ask Professor Wigglesworth about the esterases in the membranes surrounding the nerve, which are possibly also in the membranes surrounding the ganglia. If there are hyper-esterases there, it seems possible that when something like acetylcholine is injected into the insect, which does not have a physiological effect when that is done, the esterases may break it down before it gets into the ganglia.

I have actually tried to get acetylcholine through this membrane in the same way as Mr. Hoyle did through the nerve, and found that it did not give an increased physiological action that way.

THE LECTURER: I take it that you got no effect after the injection of acetylcholine. Actually that does not surprise me, because the nervous system takes the utmost care to protect itself against acetylcholine, and not only are there esterases in the sheath but the whole of the nerve in among the axons is very rich in esterase. That applies in the entire nervous system, so that it is very difficult to get at.

THE CHAIRMAN: I should like to thank Professor Wigglesworth on your behalf. He has stated and underlined several times the undoubted fact that the new items of information that are coming out of the work of himself and his colleagues, and of course similar research schools, are fundamental to further advances in the efficient use of insecticides. Unfortunately he does not make life too simple for we poor chemists. To take the very simple case, as he called it, of the epidermis of an insect. I get the impression that if we want to get a chemical fluid through that epidermis, it is not a matter of getting from Base Camp to the top of Everest, we must get from Base Camp to Camp 1, and with great difficulty to Camp 2, Camp 3, and so on. It sounds very complicated.

I mentioned in my opening remarks that the problem of translating research results into techniques useful in agriculture is very difficult. Whilst some of the things that Professor Wigglesworth has said this afternoon are doubtless beyond the immediate ken of farmers or even of people suffering from body lice, it is up to us in industry to apply these results of his research to our work and together find answers to many world problems.

May I, on your behalf and my own, thank Professor Wigglesworth for his lucid and illuminating address.

A vote of thanks to the Lecturer was carried with acclamation.

MR. A. R. N. ROBERTS (A Member of Council of the Society): May I claim the privilege, on behalf of the Council of the Royal Society of Arts, of our distinguished lecturer and I am sure of yourselves, of expressing our warm thanks to Dr. Holmes, our chairman, for his conduct of the chair.

I do not think there is any worker in his sphere who better exemplifies the motto of the Royal Agricultural Society of England: practice with science. Dr. Holmes was brought up in rural Warwickshire, and in his studies of the best means of controlling crop pests and diseases he has never forgotten the doubts and the difficulties of the man on the job, a thing which the scientist who wraps himself in the ivory tower is so apt to do. Therefore I think it was altogether appropriate, when Constable's published a book from his pen last year, that it should bear the title of *Practical Plant Protection*. Of course, that fact that Dr. Holmes is the Technical Director of Plant Protection Ltd. was, as they say, purely coincidental.

Dr. Holmes has not confined his studies to this country. There is probably no worker in his sphere who has such a world-wide knowledge of these problems as reposes in his own head. That, I think, is one of the reasons why he will never be known as 'one of the stately Holmes of England'!

There are two other reasons; one, as a church worker at Fernhurst once put it to me, is his fondness for stories which are perhaps a trifle racey, and the other is, and here I speak from personal knowledge, that he is much too good a colleague and friend ever to stand on his dignity by keeping his wide knowledge to himself. He is, in fact, ever willing completely to share it with anyone whom it may help.

So, Sir, I would like to thank you, not only for your conduct of the chair this afternoon, but for half a lifetime of unselfish service to the solution of one of the major problems which affects a hungry world.

A vote of thanks to the Chairman was carried with acclamation and the meeting then ended.

DESIGN FOR TELEVISION

A paper by

F. H. K. HENRION, M.B.E., F.S.I.A.,

read to the Society on Wednesday, 1st February, 1956, with Sir Kenneth Clark, K.C.B., Chairman, Arts Council of Great Britain, and of the Independent Television Authority, in the Chair

THE CHAIRMAN: I am going to ask permission to draw a distinction between an *élite* and a mandarin class. It is axiomatic that no society can prosper unless a few of its members, be they shop stewards or commissars, or members of the orders of chivalry, are willing to assume the responsibilities of leadership. In an *élite*, as I define it, this responsible minority has grown out of the mass and is rooted in the same soil and speaks the same language. The members of the English governing class who passed the Reform Bill of 1832 were an *élite*; they differed from the people they governed in wealth, in opportunity, and in education, but they were basically in agreement with them. They shared the same prejudice, they had interest in the same things, in the same sports, in farming, they even shared in some of their disreputable pleasures.

As for the mandarin class, apart from mandarins whom I suppose have not been maligned in this respect the classic example is pre-revolutionary Versailles, that strange world of its own, ignorant of everything that was going on in France, even referring to itself as a different country as *ce pays ci*.

I think it is hardly necessary for me to tell you how this distinction applies to the subject we are going to consider this afternoon. Almost every educated person I have ever met says to me with a self-satisfied smirk, 'I am afraid I have not got a television set'. There are many good reasons for this, some people are too busy, others have interests which they do not wish to see interfered with; and perhaps there is a reason within the television programmes themselves. But seen as a whole I think that this particular relation of haves to have nots (which as you know is almost an inversion of the old haves and have nots) is exceedingly dangerous. It is going to create a cleavage in those basic interests and points of agreement, even a difference of language, and that cleavage as I have just suggested is what distinguishes a mandarin class from an *élite*.

It is therefore with rising spirits that I welcome anyone with the intelligence and experience of Mr. Henrion who has had the far-sightedness and the sense of his own times to apply his mind to the problem of television. There are, of course, a lot of very clever people applying their minds to television, but they are all concerned with the immediate problem of how to get through the evening, how to feed this insatiable medium which allows them no opportunity to take a longer view. Now we are going to be shown a longer view.

The following paper, which was illustrated with lantern slides and a film, was then read:

THE PAPER

I hope I will be permitted to treat the subject of this talk in its wider application. It is ordinarily assumed that the designer's *rôle* in television is that of

a man who designs the settings and is responsible for the costumes and all incidental properties, as well as devising titles for particular programmes. But it is not my intention to deal with this particular aspect of a designer's activity, as there are doubtless others who have greater experience in this field, and also because the designer's contribution is accepted here—indeed it is required. What I should like to take as my theme is the potential contribution of the designer to television as a medium; for there his contribution, though required, is so far not accepted at all. As it is primarily a visual medium, the man who makes visual expression and visual communication his job would be obviously the one who could control it most efficiently and—at its most ambitious—conceive of it as a work of art. These may seem high-sounding words but, judging by what we are mostly offered by television, both here and overseas, it is essential that our standards should be pitched as high as possible. I should like to impress upon you the potentially shattering influence of television in almost all the spheres of our cultural life. There has never been a medium which has wielded such power in forming opinion, influencing people in their habits and their appreciation or rejection of things and values.

To-day we are becoming used to situations where the ordinary man is faced with the almost unimaginable, with the result that the imagination fails. Where a million is a very great quantity, a billion—to the tired mind—just seems a little bit more. The atom bomb in its effects presents quantities and volumes which most of us fail to fathom, and the hydrogen bomb seems to be beyond all comprehension compared with that already out-of-date device which was dropped on Japan. I submit that television in its effect on the public fails similarly to impress its undreamt-of potential power.

Nobody who is interested in visual communication and in social and spiritual progress through it can afford to ignore, or even fail to interest himself in, this all-powerful medium. The intellectually snobbish attitude of priding oneself in not having a television set is out of date, and equals that of people who adopt an understandable though indefensible attitude in trying to ignore potential effects of nuclear fission and what they could mean to all of us. To illustrate this statement I would take two examples. The first is *Oedipus Rex*, a drama written 2,500 years ago, translated into most modern languages, and enacted many thousands of times from the period when Sophocles wrote it to the present day. It is possibly the best known classic drama typical to all mankind, already existing as a myth before Sophocles wrote it, and still pervading our whole mental and psychological life. The second example is the most popular television programme yet devised: 'The $64,000 Question', an American programme, sponsored by a cosmetic manufacturer, which has reached an audience of fifty million people. This programme consists of somebody who claims to be an expert on a particular subject being asked questions on it: if he gets the right answer his reward, starting at $1,000, is doubled with each subsequent correct answer; but if he cannot find it in a given time, he foregoes the lot. So far a few people have gone up to $32,000, then hesitated to go beyond it, risking the loss of $32,000 to win $64,000. The whole nation, through press and radio, joined

them in their agonized decision whether or not to go on with the contest. One of them sought guidance from priests and spent days in prayer before he made up his mind to stop at $32,000, having by then become a national hero. In the end, a marine captain braved the risk and won the whole prize and the entire nation, in self-identification, suffered with him the underlying greed, the emotions and the anguish. Exact statistics are naturally not available, but it is probable that the audience of this ten-minute spectacle numbers more than the sum total of all audiences, throughout the world, who have ever watched *Oedipus Rex* in the last 2,500 years. This consideration seems to me frightening; at the same time it shows the fantastic power wielded by the invention which, according to an American writer, consisted in making a piece of living-room furniture light up. This power is even more difficult to grasp, as the comedian making a stale joke to the cold eye of a camera in a sealed-off studio must find it difficult to realize how, at the time of speaking, his joke will be received up and down the country, in the suburbs, the pubs and hospitals. He can hardly conceive the million homes in which this joke falls flat. Likewise it is even more difficult for the audience to realize how very many others are suffering this joke, as the audience is usually divided into such small groups, of an average of three persons, gazing patiently at the lighted window in their furniture.

I have dwelt at such length on this particular aspect in the hope of shaking out of their complacency those who are concerned with the spreading of ideas, knowledge, and entertainment to the majority of the people. But what can be done? Being a designer, I should like to approach this problem as a normal job in which I am asked to design in a new medium, such as glass or plastics for instance. I should try to analyze and understand the peculiarities of the medium, try to determine its limitations, and thereby its scope. It is a fair criticism to say that if a solution is true to its medium, and cannot be emulated in any other medium, though it may not be necessarily a work of art, it is nevertheless a creative step in the right direction. A painting which looks like a photograph or a photograph which looks like a painting cannot be the best of its kind. A photograph which conveys something which photography can convey better than any other process is truer to its medium, and therefore of greater value. I should like, therefore, to attempt to investigate where television is peculiar to itself, and try to find ways in which it can convey things unlike any other medium. In his great essay, John Locke divided all that can fall within the compass of human understanding into three categories. The first he called *Physica* (the knowledge of things as they are . . . the constitutions, properties and operations); the second *Practica* ('The skill of right applying . . . which leads to happiness'); finally *Semiotic* (the doctrine of science . . . to consider the nature of science the mind makes use of for the understanding of things, or conveying its knowledge to others, including language and other ways of communication). The formula cannot be improved, and if applied to television might lead to the answers we vainly seek to-day.

But I am afraid I shall not be able to go all that way—in fact, all I will attempt to do is to try to analyze what we know of television as it is and to try to observe

what constitutes its properties and how it operates. With luck this might lead us to the second heading, *Practica*. I fear I will fall short there of suggestions. As to *Semiotic*—the doctrine of communications in our particular case, the science of rightly applying the skill which leads to happiness in textbook form, this, I am afraid, I cannot even attempt. All I know is that Locke's sequence is the right one and that at most I can express a hope that others will follow on in the spirit of the second and third headings, whilst I stumble over the first. Of course, everybody directly concerned in television to-day is much too busy preparing, devising, and producing programmes to fill the avid screens; so guidance will have to be sought from a neutral observer stationed neither at the source nor at the receiving end, but assessing both with understanding and sympathy. Again, I am not suggesting that I am this selected observer, but I will try to assess what I see, at least from that neutral position being neither too much involved in the programme making, nor unduly in the viewing, in so far as many of my evenings are reserved for other occupations.

The observations I am going to make are based on occasional work I have done for the B.B.C. from time to time over the last ten years; they are derived from more recent experience in the preparation and execution of advertising spots, and a journey—a few months ago—to the United States where I saw a good deal of television, and visited several studios of N.B.C. and C.B.S.

First of all, there is one field in which television is at its best. It is in the straight reporting of events, not after they have happened—as is the case with newsreels—but as they are happening. This superficially unimportant fact matters very much, however, because viewing is topical, and what is seen happens before it has become history. The sports event, whilst the game's decision is in the balance, will thrill much more than a recording screened afterwards. The Coronation was unquestionably the high spot of television reporting; it was seen as a historical ceremony unfolding itself; with the result that the viewer participated in the event, hobnobbed with the great, and looked-in with the crowd on the screen. The result was more than communication; it was emotional communion, mixing across the screen with the great of the world, with the images of living royalty and nobility. But coronations are not yearly events and, sports and games apart, most of the television news is recorded at the time but only shown after the event in the same way as film news. Similarly we can take part in a play which is sent out from a West End theatre, but in that case the viewer experiences the play less directly than those watching from the stalls and balconies; there is a strong second-hand flavour about it. Plays especially written for television are obviously very much better because the limitations of the medium are taken into account. The producer is aware of the smallness of the screen and produces a play in a more intimate way than his colleague of the theatre. The B.B.C. has attempted to commission special plays for television with varying degrees of success but in a praiseworthy spirit to produce something in the terms of the medium.

Panel games have proved popular and some have been very successful. It is only fair to say that one of the causes of their success is that the viewers are told

beforehand the correct answer to a problem which is then put to a panel of well-known and distinguished experts. Consequently the viewers enjoy—without effort—the privilege of having more knowledge than the expert. Others, however, especially the televized humiliation of members of a theatre audience rewarded by a prize for their public suffering, fall well below the standards of decency and dignity. Is it the lowest common denominator which dictates the programme, or could we not aim at the highest common multiple? In Jean Cocteau's words, 'Is the plural to dictate to the singular?' or is it the moral duty of the gifted few to give what they have to the many?

FIGURE 1. *In the studio; four cameras with their various studio managers and so on, shooting a play*

It is often advocated: give the people what they want. Vast sums of money and energy are spent on research to find out exactly what this is, in order to give it to them. People thus asked are, of course, already conditioned by previous broadcasts, and such is the power of television that in all likelihood you get no more than a playback of what you have already seen. Testing can never be creative, only re-creative. If you shout into a wood, you have a fair expectation of what the echo will be like, if there is an echo. Testing is only a stimulated artificial echo, not even a spontaneous reaction. Nothing is more dangerous than to put the chart before the course, the ever-increasing practice of trying to make a creative force of statistics which are at best only a record of facts, and very often only irrational reactions falsely rationalized by the observer or field-worker.

Of course, there is yet another danger to this medium of television; it is the automatic fascination of the moving image focused on the lit-up screen in the darkened room. There is no merit in the pendulum itself which, swinging in front of one's eyes, mesmerizes and fascinates. It is merely a phenomenon, and the television image exercises a similar effect on the viewer, irrespective of what the moving image tries to convey, thereby numbing discrimination and judgment. I have seen people switching off the sound because it bored them and interfered with their conversation, yet still looking with fascination at the moving picture. The fact that television has this easy fascination, no matter what it shows, is a dangerous temptation for those whose job it is to fill the ether with pictures for 15 hours a day, to send whatever is easy, economical and available. Many television critics in the more serious newspapers and periodicals make sincere and honest efforts to criticize what is shown. They make a valid contribution but, as most of them do not in any way represent the opinion or judgment of the vast mass of viewers, their cries in the wilderness are not always taken as seriously as they deserve by the programme makers.

If you go to a theatre, you have to select the play, reserve seats, dress specially for the occasion, and arrive in time to enjoy the spectacle selected. If you go to the cinema, you have to go through some similar process of selection; you have to queue, or at least make some effort in return for your three hours' entertainment, information or escape; not so television. It is laid on like a service, such as water, electricity, or gas, but with a difference: you only turn on the water when you need it; and if you leave it on without using it, it will probably damage your furniture, floor and belongings. Electricity does not flow out of lamp sockets, as was imagined by James Thurber's aunt. A lamp has to be in the socket, in fact it has to be used, otherwise the current stays within its circuit. Gas has to be burned to be used, and if you turn it on without using it, it will eventually kill all the people in the room. This latest service, however, television, can be turned on without being used. Indeed it is turned on thus very often and people look at it without seeing it. The effect may be mentally asphyxiating, but the results are less obviously dramatic than in the case of the turned-on, unlit gas tap. This situation, which may vary in degrees, is another complication of the medium. Viewers are easily fascinated but not basically interested, so that they are both too lazy to switch it off and too lazy to watch with any measure of concentration.

FIGURE 2. *In the control room; the producer with vision mixer, secretary, technician and lighting engineer*

The obvious difference between radio and television is that a visual message has been added to the sound, or in the special American kind of television language which has developed: to audio is added video. In many programmes, however, one is painfully aware that vision has been added to a purely acoustic programme. It is not good enough to see and hear somebody talk, and although it is fascinating to know what speakers look like, to be able to see them speak does not justify the purchase of a television set, or the very expensive transmission of a talk.

It would seem that there is little difference between the cinema and television, but this illusion is a dangerous one. The television screen is intimate, asking and admitting only a small audience, so that anything shown is much more concentrated and of necessity simpler than in the cinema (it is perhaps symptomatic that, as the television habit becomes more and more accepted throughout all houses up and down the country, conditioning people to concentrate on a small intimate, domestic screen, the cinema screen should expand and grow to 3D, Cinerama, Vista-Vision, and Cinemascope, this latter name being perhaps the most typical, as all these new developments give new scope to the cinema as a medium distinctly different in use and purpose from television). As the television screen invites simple objects, concentrated action and simplicity, the new cinematic developments herald new complications and stunning actions

for our eyes and ears. We are being visibly and audibly assaulted and overwhelmed; stereophonically and stereoptically we might yet turn to our television set as a quiet and simple comforter to our outraged senses. As in the cinema the picture is transmitted in motion, but in this television is unique: it has conquered time and space, and the audience can take part and observe an event whilst it happens. In fact, something unheard of is possible, the subject can objectively view itself. A man can sit with a camera at both his sides, his back and front, and see himself in movement simultaneously from all sides—a measure of empirical objectivity hitherto unachieved. This man can look at himself from all sides in four separate monitor sets, or all four pictures can be superimposed on one screen, so that he can combine the separate visual experience of four observers placed around him. To put it more dramatically, a jockey on horseback with a small monitor set on his saddle could see an air view of himself and all his other competitors, a close-up of the public watching him, see himself overtaking the leading horse, and, whilst experiencing his victory, can watch the judges and crowds reacting to it. I am not suggesting that an experiment of this kind would provide an entertaining evening's programme, but it shows the direction which television can explore to achieve something nothing else can do. I give another example of how the simultaneous superimposition of pictures can create fascinating results. Sir Francis Galton tried to superimpose a number of photographs of members of the same family in order to lose the individual and achieve the family face, the common denominator—in fact, visual mathematics (Figure 3). Reading about his experiments, made in 1890, I tried to establish in static photography the typical faces of an American and a British car by superimposing twenty car faces of each nation (Figure 4). With motion added I can see exciting possibilities, not necessarily brought to this extreme, but making a more creative visual use of the present studio technique.

FIGURE 3. *Specimens of composite portraiture, personal and family. A number of photographs of members of the same family were superimposed to lose the individual and achieve the family face. An experiment carried out by Sir Francis Galton in 1890*

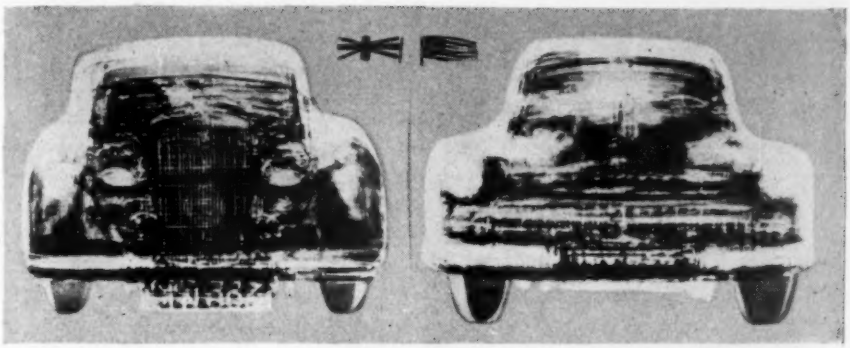

FIGURE 4. *The photograph shows twenty car faces of British* (left) *and American* (right) *cars superimposed. Magazine layout, 1950, by the lecturer, based on Sir Francis Galton's experiment*

Figure 5 shows what usually happens in a studio when four cameras, shooting the same object from different angles and distances, are connected with a different monitor. The producer, like the Air Marshal in Bomber Command, directs, through one girl in charge of all monitors, which picture should go into the air; it can be seen that this man controls entirely what the viewer sees, and from which angle and in which sequence. Ideally, everything should be planned beforehand so that a fascinating sequence of close-ups, longshots, midshots, and so on, is achieved. What, however, often happens, especially if two or more people speak together, is that the producer acts more like his war colleague, the Air Marshal, and switches cameras off and on in an effort to keep track with a conversation, showing whichever face belongs to the speaker at the time, acting more like an air gunner keeping an enemy plane in his range, than one who controls and composes a message of visual as well as acoustic merit.

Of course, the difficulties of devising and directing a programme are enormous, and worse than any, perhaps, is the fact, again unique to television, that at the moment the picture appears on the screen and comes to life, it has already died, never to be seen again—unless it is filmed for later reshowing. In the theatre a play is acted, repeated, and all the performance gradually improved. The film has a claim on time and can be repeated in many countries for many years. A piece of music can be performed and can be perfected. In fact, a work of art has as its main criterion the value and appreciation it achieves with time. Giberti worked for 27 years on the bronze doors of the Florence Baptistry and this work has been appreciated for 500 years and probably will be for a long time to come. A television programme, however ingenious, is doomed to die as soon as it sees the light, only creating another emptiness immediately it is over. This must be a frustrating prospect for any creative man. In fact, it must be fully realized how extremely difficult it is to fill the air with pictures hour after hour, day after

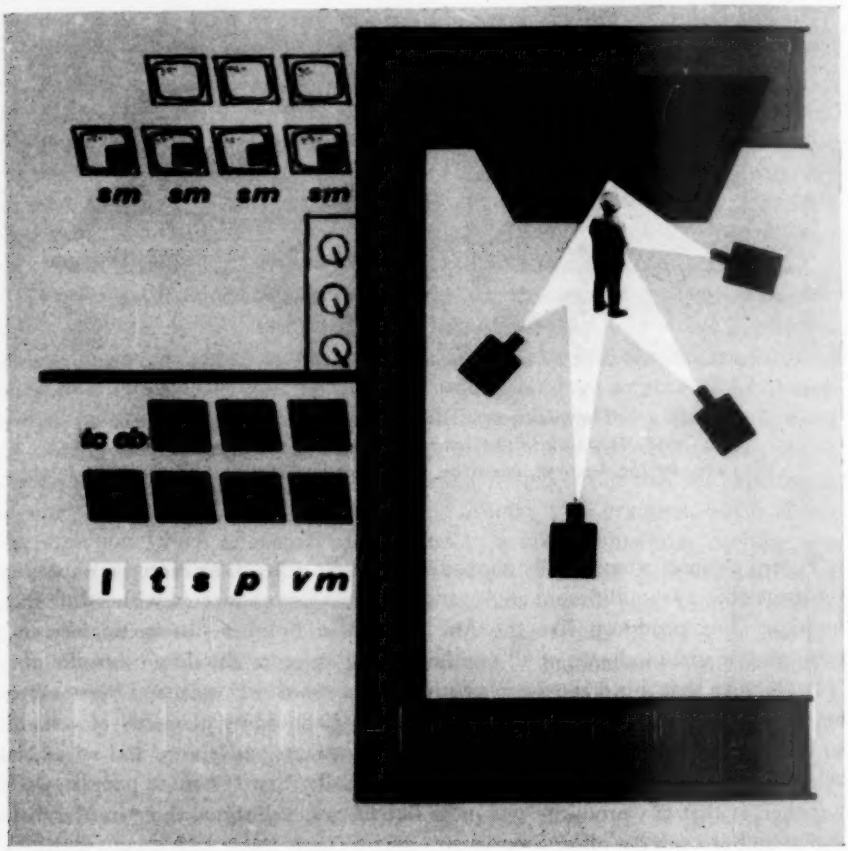

FIGURE 5. *This explains Figures 1 and 2, showing how monitor sets in vision mixing and sound mixing tie up with the cameras in the studio. sm = sound mixer; vm = vision mixer; p = producer; s = secretary; t = technician and l = lighting director*

day, and any criticism I am voicing here is not directed against the many devoted (and persevering!) men and women who fill the void of this Danaid tub. The barrel which sprang ever-new leaks as the poor creatures tried to fill it was a symbol of endless torture in antique Greece. Television presents a contemporary equivalent. So any man devising or producing television programmes must have our sympathy, but at the same time we must also remember that he can reach and influence a potential fifty million people. This puts an enormous responsibility on the thus frustrated producer, but in view of the sheer numbers our concern must be more for the fifty million and the effect the programme has on them. Moreover, physical difficulties in producing any programme are enormous, as anything which is done depends on the collaboration of many people who have not only to be co-ordinated, but won over as willing members of a team. Once an idea is conceived, it has to be realized with the help

of technicians, administrators, and all the various levels of help which delegation entails. The director has to know about the limitations and scope of lighting in order to persuade electricians to give him the effect he requires. He must be an expert in human relations and a leader of men, as well as an able administrator and delegator in filling his whole team with enthusiasm for his project, overcoming with them—not against them—any technical obstacles; yet in the process of seeing to all this, he must not lose or dilute his original conception.

I am now speaking of television programmes where television is used as a creative medium true to itself, rather than as a mere recording of events, talks, plays, music, or other entertainment. It is only in this possibly narrow sphere that it could ever aspire to be an art form. Experimentation and research in this field would lead to finding new visual techniques, and in turn all the other programmes would benefit from them. It is astonishing to see how very soon after the motion picture was invented imaginative people in most countries exploited the new medium, and did exactly what I am trying now to advocate for television, namely developed new techniques to create an entertainment of a kind which could only be approached by the cinema. Melies, and other film pioneers, created the basis on which the René Claires, Pabsts and Hitchcocks of to-day were enabled to achieve their masterpieces. The use of simple visual patterns could be intriguing and become meaningful where a word key is supplied. A line, a semi-oval and a triangle may represent—as Annibale Carracci showed—a blind beggar feeling his way around a corner, or a knight riding to a banquet,

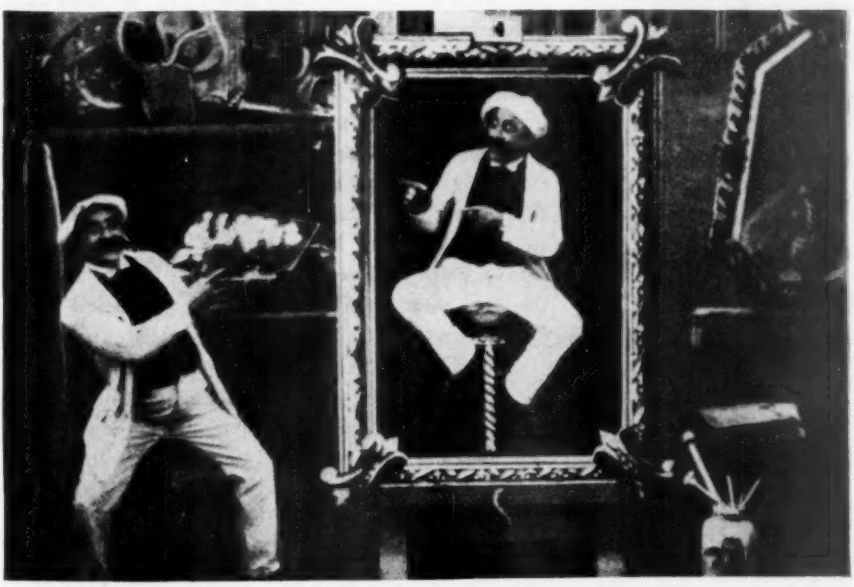

FIGURE 6. *Still of* Le Portrait Vivant, *Zecca, 1904, exploiting a technique of double exposure*

FIGURE 7. *Annibale Carracci showed a blind beggar feeling his way around a corner (vertical view), or a knight riding to a banquet, lance over his shoulder (horizontal view)*

lance over his shoulder (Figure 7) behind a wall. Without this key we only see a meaningless geometrical configuration. Given the key, we instantaneously relate these forms by seeing before our mind's eye what is not represented behind the wall. It seems to me that a lot can be learned for television from this seventeenth-century example. These various illustrations will underline my claim that in this field of experimental television the man best suited for the job is a 'visual' man who has studied visual problems, who is naturally talented in his craft and has by training and experience enlarged his talents, and who is able to apply his talent and his experience, his irrational gifts and his rational mind, to the job. This man can only be a designer and at that one who in addition to all the qualities enumerated must have great organizing and administrative capacity, which should not, however, overshadow his creative work.

At the beginning of my paper I quoted Locke's three points, stating that I could only attempt to deal with the first, and indicate directions towards the second, leaving the third to future developments. Likewise, in trying to find this man, the ideal television producer, I can only point to the likely profession from which he may come, and hope that some institutions will lead the way by training the most gifted students and so produce such a man. No effort should be spared, and no experience either, as eventually these people will be responsible for the state of mind of fifty million people. One of the first steps would be to have an experimental television studio with a closed circuit where, with at least three cameras, new ways could be pioneered without subjecting the public to each experiment which seems necessary at present. The fact that directors and producers can only experiment when they are on the air means that necessarily the edge is taken off anything which is unorthodox or new, in case it may offend or fail.

Everything which happens objectively on the studio floor is transmitted subjectively through the director's eyes which guide and direct the camera lenses. The same performance can be reported by different directors in as many different ways, to make it exciting, revealing and delightful, or the reverse. A man with an unreceptive eye can go to the Far East and back and merely report on a dull journey; another, with a curious and discriminating eye, can discover new excitement and revelations in five minutes on his daily walk to work.

I heard and saw one of our most eminent conductors recently, performing, with a large orchestra, most excellent music. Although the cameras were very active, showing each instrument as it came into action, interspersed with shots of the conductor's face and hands, I found the performance visually an embarrassment which made me long to turn off the vision, as only the sound was pertinent and enjoyable. Despite the fact that something was happening all the time on the screen one could not help feeling, as on so many other occasions, such as listening to a one-man talk and watching the speaker's face all the time, that only the poorest and most obvious use had been made of a brave new medium.

As this one pair of eyes guides and leads potentially fifty million other pairs, it is worth making every possible effort to find and train the first pair before they guide those millions of others. Producers and directors must be visual men, and visual men must be producers and directors. To paint backgrounds, to design costumes and graphic effects is most important, but, however gifted and inspired the men and women in these jobs may be, it is but of small avail unless their work is shown at its best and made part of a visually exciting continuity conceived in advance and worked out in detail. It is not sufficient to produce sound which has to be accompanied willy nilly visually because the medium is received through eyes as well as ears.

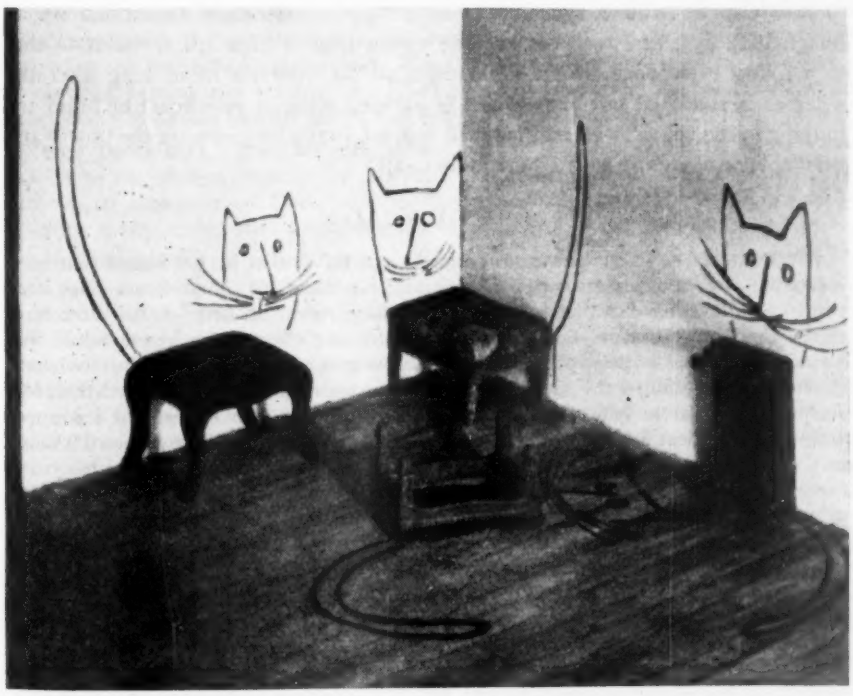

FIGURE 8. *Steinberg drawing showing how everyday objects can assume new meaning if controlled by an imaginative eye*

In the film world Orson Welles, for one, has proved how the imaginative vision of one can impart excitement and delight to the many if the performance is conceived and directed by a man of singular discrimination and vision. Steinberg, in the graphic field, has shown how the fresh eye can reveal new experiences in every-day things which are so common that normally one does not even notice them. By rediscovering them graphically he has made me and many others aware of countless phenomena which were so familiar that they had become almost meaningless. Studies of abstract patterns and sounds, as created by Norman McClaren, could show new ways altogether for use in television. One could imagine poetry especially written, and visually interpreted, for the new medium. The illustrations would be not so much an accompaniment of the more realistic and academic type, but complementary to the spoken word and literary image, creating an abstract world of symbols or a dreamlike, surrealistic atmosphere where visual images merge into each other as they often do, in fact, in the word-sequence of a poem.

Several films have been made featuring a single painting only. For instance, *The Feast of St. Isadore*, by Goya—a series of details in close-up, accompanied by Segovia's guitar—shows how a picture can come to life through the intelligent use of a new medium. The camera, with its talent for objective and selective concentration, was able to light up details of Goya's painting in a way impossible to the human unaided eye. In the same way television, if controlled by an imaginative eye, can raise the act of viewing from a time-killing habit to that of a living experience which will remain in the viewer's mind long after the receiver is switched off. Experience is nothing without retrospection; and the judging of television as an art form will depend, in the long run, on the power and permanence of its impact for good upon us all.

DISCUSSION

THE CHAIRMAN: The chairman is so fascinated by all that he has heard that he is incapable of containing his own remarks until comments of the audience have been made! So much has been said that is really stimulating and helpful. All those hard things the lecturer had to say about statistics go very close to my heart and all that he said about the horrors of television because it required so little effort (wherein of course it is fulfilling the whole concept of education in the last 25 years) that, too, seems to me extremely worth saying and most valuable. But in the end I suppose what was said most forcibly and at greatest length was an appeal to us to use television as a visual medium. There I have more reserves. In fact, what we see on a television screen is produced from life. We do not think of life as a visual experience, we think of it as a general experience. Sound broadcasting was the experience of a blind man, television is normal experience. The old silent film was a pure silent film—and I yield to none in my admiration of the fantasies of Melies—but even the old silent film finally found itself conquered by life. The fantasies, the tricks, the technical specialities of the medium, were gradually pushed aside because people are primarily interested in life and that, I think, is going to happen with television. We shall always be grateful for the people who think in visual terms and who enrich our visual sensations, but in the end what we look for in television is a reflection of experience. The trouble with a great deal of television now is we do not get it. What we do get is a miserable mauvish, woosy fantasy, and what I think all of us who are interested

in the future of television would like to see is more life. However, that is perhaps taking the subject too far because, although this may be the ultimate destiny of television, there is no doubt, I think, that this visual approach is going enormously to enrich the powers of the medium. A paper like this cannot be anything but most stimulating to all of those who are concerned with television.

MR. GEORGE HIM: I feel that television, like any other art, should not be life itself but sublimation of life, and if so, this ought to be produced by people with vision. That is where not the designer as a designer, but someone who can make more out of life by reshaping it in his own way, is the necessary person and surely most valuable. People who can create visions in visual terms should be welcomed.

THE CHAIRMAN: I am welcoming them.

MR. JOHN CRISFORD: Would Mr. Henrion agree that a trend is already apparent; that the cinema is concentrating more on fiction, and television more on fact? The cinema now is going in for spectacular dramas with tremendous success, which television can never do, while some of the most successful television programmes have been outside broadcasts, particularly from people's houses, as well as of sporting events.

THE LECTURER: I agree entirely, but it seems to me that there are not enough factual events to go round, because—again taking America as the example—there is an enormous amount of padding with films; because the facts being sports events, the occasional Coronation or its equivalent, there are not enough of them for 15 hours a day or, in American terms, several hundred hours a day, when all the various transmitting stations are considered. The problem is this constant finding of new material. I do not think there are enough facts to be found and you see and feel the embarrassment of the programme maker in padding all the time, to fill the void between the interesting programmes. There is no problem there. I hoped I made it clear that I think the outside broadcasts are first class; but that is not enough, something else must happen and it does not do so sufficiently often.

MISS JANET HILLS: Does the speaker feel that one day perhaps television will draw closer to the cinema because, for instance, with filmed drama there is more chance for visual competition? Does he think that the present experiments on I.T.A. in filming drama rather than presenting it live, are in the right direction?

THE LECTURER: It is a very big and difficult issue, on which even the experts are divided, whether it is better to transmit a film version or a life version of a particular drama. I believe, and as far as I know, the B.B.C. believe, in life every time. It gives us continuity which the film version does not give on television. Something should be done in television which cannot be done by any other medium—but obviously films are quite acceptable to the cinemas. If it were only a question of saving the entrance money by having a cinema at home, it might be all right, but that is not really the purpose of my quest.

MR. LESLIE ROBERTS: Has Mr. Henrion any comments to make on the future of colour television; if we eventually get it will it make a very great difference to production techniques?

THE LECTURER: It is rather a technical question. I feel somebody else could answer it better than I. Colour television is obviously coming. I have seen it in the United States and again, in the context of my talk, I was rather interested in the degree to which it would affect the creative side of television, as we have seen in the film world that every invention which increases the realism, such as sound and colour, takes away, at least at first, from the more creative side of the medium. People enjoy just hearing sound and seeing colour, then comes a time when the novelty wears off and something is made of the new medium. But I do not think it would affect the main issue; it will follow a pattern similar to that in the film world, I believe.

MR. W. M. DE MAJO, M.B.E.: Mr. Chairman, I am still rather perturbed at some of your closing sentences. I wonder whether you could reassure us and confirm that what you said was in no way conflicting with what Mr. Henrion said in his paper to-day. If I may put it briefly, I understood you to say: give the public what it wants, give it not dramatized visual presentation but give it just real life. I understood Mr. Henrion to say that the man he was advocating, the professional designer, could do just this, but rather better by dramatizing simple everyday events.

I understood you to say that, while on the one hand you welcomed someone of Mr. Henrion's talents here to-day, you did not really think that this was what was wanted for television. It seems to me that someone with Mr. Henrion's qualifications could present everyday life in a much more interesting and exciting way than the rather dull and uninteresting manner we are shown on television to-day. Am I right in understanding the issue correctly?

THE CHAIRMAN: You are totally wrong in understanding what I said if you think I said that the public should be given what they want. The poor public will get what they want to a very large extent for economic reasons, but the whole art of anyone who deals with the public in matters of taste or entertainment is gradually to lead them to like things which are going to last them a little longer, or which they are going to enjoy a little more fully, or which are going to enhance their lives rather more. So in so far as you interpreted me to say that, it was a mistake. What I was saying about the films or about television is that in the end what people are interested in is life. By that I mean the story, the personality, the characters, the life content of anything that is shown. Although the element of fantasy and fantastic design and invention that Mr. Henrion talked about is extremely valuable and more refreshing, one must not get the idea that a new medium and a new technique are going to wipe out that basic need that we all have in all the arts for something that is concerned with human emotion and human experience.

MR. DE MAJO: This is what I understood you to say, although, of course, you have put it much better. But I still think what Mr. Henrion tried to explain was that a creative artist, if he were also the director-producer, could feature even the aspect of everyday life so much better. With his examples I understood him to explain only some possibilities of more interesting presentation technique, such as the three-in-one view of a picture instead of using the ordinary single-picture method; in other words, presenting a particular story more vividly and imaginatively for the screen than is done at present. I did not think that he was advocating that all stories were suitable to be presented in the same manner but tried to show just a few possibilities.

While I understand you to refer to his examples as 'fantasies' which would over-excite the story instead of giving it 'just life', Mr. Henrion surely said: Let us present 'just life' by all means; that is what we want to see, but let us present it more descriptively, putting the emphasis where it should be, with a bit more imagination, and more dramatically, than the la-di-da manner in which most television programmes are being dished up at present.

THE LECTURER: I think I agree entirely with Sir Kenneth as he explained the position. I should rectify an impression I seem to have left. I could not have made myself very clear, especially as the chairman seems to have got this false impression. I may have used as illustrations those gay French films, which are all very imaginative and fantastic, but what I tried to explain—apparently not very successfully—is that television, in reporting life, reports it very subjectively through the producer's eye. I do not think there is any such thing as objective reporting. Whatever is seen on the screen is shown from one person's angle or several person's angle. Very much depends on how news is presented. In the presentation of that I feel that a visually experienced imaginative man might convey a more true picture of what is happening than a mere reporter and technician. If the men behind the television camera had the same

enthusiasm for and preoccupation with their medium as the early French film pioneers, our programmes would be much more alive and inspiring than they have been hitherto.

THE CHAIRMAN: I think we were perhaps a little misled by the emphasis given to the early films. It is quite true that when the early film makers started they were fascinated by what could be done with that medium in the way of fantasy—the people who built the walls by throwing bricks over their shoulders, and so forth. All those things were very agreeable and they lasted for a time, as the new technical developments of any new medium do, but in the end such novelties are absorbed and we come back to the same things that have interested human beings for 2,500 years.

MR. HOWARD WADMAN: Should I be right in thinking that what we need is a blend of the visual and the humane? There is a famous film passage which is often quoted—'The Odessa Steps' sequence. Many people are fond of looking at this sequence and are perhaps dazzled and intoxicated by the pattern of the steps; but is not the real interest of that scene the fact that a lot of people may be shot dead by the forces of reaction? Is that not really what is holding one's interest in the steps? It seems to me that a visual man who is only a visual man may go away from such a scene intoxicated by the pattern of the steps and forgetting what the public was really interested in. It is the two things blended together that make great cinema, and presumably will make great television. This surely is why the theatre is greater than the circus. At the circus one may see stunt cycling, which is very remarkable, but it may be much more wonderful to go to the theatre and see a man sitting quietly in a chair and talking about the way life is lived and death is died.

THE LECTURER: The title is *Potemkin* I think, by Eisenstein. I agree entirely with you, of course. If I made the case for the visual man very strongly, of course it must not be one sided. Perhaps in my enthusiasm I stressed the visual side too much. If I did that it was only because it is usually not in my view sufficiently considered. The steps alone are of no interest, but making the steps do a job in connection with the screaming women and children was certainly the success of the film.

THE CHAIRMAN: We really owe Mr. Henrion a very great debt, because he has treated television as an art. It is the nature of art that the means of communication and the technical inner character of the medium enhance and give a durability to the human content which must underlie all art and that, in fact, is what he has been telling us about the application of art in television. Thank you very much.

A vote of thanks to the Lecturer was carried with acclamation; and, another having been accorded to the Chairman, the meeting then ended.

GENERAL NOTES

CHILDREN'S PAINTINGS AND DRAWINGS

The 61st annual exhibition of the Royal Drawing Society, the pioneer of exhibitions of children's art, will be on view at the Guildhall Art Gallery, London, from 28th April to 12th May. The pictures were selected from entries received from schools in this country and the Commonwealth, the entrants being aged from four to 17 years. Also, this year the exhibition includes a series of pictures by children of five and six years of age which have been collected from Paris kindergartens and lent to the Royal Drawing Society by the French Embassy. The exhibition will be open on weekdays from 10 a.m. to 5 p.m.; admission will be free.

TRANSPORT RESEARCH GRANT

Applications are invited for the two Rees Jeffrys Studentships offered this year. These are tenable at the London School of Economics and will enable the holders

to devote at least one whole year to full-time research into the economics of transport. The Studentships are open to any person who is or has been engaged in the administration of transport or in the production of transport equipment or facilities, and to university graduates. The Studentship, each of which will be of the value of £500, will be tenable from 1st October, 1956, for one year. Full particulars and application forms, which must be returned not later than 1st September, 1956, can be obtained from the Registrar, London School of Economics, London, W.C.2.

CORRESPONDENCE

IMPERIAL INSTITUTE

From *MR. MARTIN A. BUCKMASTER, A.R.C.A., HON.A.R.I.B.A., 9 COLEHERNE MANSIONS, 230 OLD BROMPTON ROAD, S.W.5.*

I am glad to see by this month's *Journal* that the Royal Society of Arts is doing its utmost to save the Imperial Institute from demolition.

I likewise was a modest subscriber to the building, attended the opening ceremony by King Edward VII and the banquet following, joined the Imperial Institute Club and also worked in the building as an Examiner to the London University. Its destruction would be a wanton act of vandalism when one knows the type of building that might replace it. I have written several letters to the press and to Members of Parliament. Please continue your good work.

NOTES ON BOOKS

DECORATED PORCELAINS OF SIMON LISSIM. *By Raymond Lister. Golden Head Press, 1955. 31s 6d*

Simon Lissim is a cosmopolitan. Born in Kiev in 1900 his education started in Russia, which he left in 1919, and presumably continued during his European travels. He settled in Paris until 1940 and after demobilization went to the United States, where he is now Associate Professor of Art at the City College of New York.

Lissim is clearly that *rara avis*—a successful ceramic designer who is also an all-rounder; indeed he seems to be better known for his stage designs than for his porcelains. One wishes that Mr. Lister's book showed us more of his other work, for the reader is tantalized by frequent references to it; one wonders what parallels there were in his stage sets to those extraordinary beasts and fish—of such oriental features—which decorate many of his porcelains. Was this refreshing combination of formality and spatial freedom to be seen in the paintings so often shown in Paris?

The Golden Head Press has produced a limited edition whose cover, paper and typography do justice to the subject, but I would gladly have sacrificed the beautiful blue and gold cover for one or two good colour plates inside. The ceramic artist wrestles with special colour problems. Only certain colours will withstand the rigours of firing. Some will go under the glaze, some only on top. Some need several firings to bring out their richness. These are factors which have to be reckoned with those of shape and body. No words, even combined with black and white plates, can really convey to us how effectively Lissim dealt with these difficulties.

Of his 500 designs, most were for single pieces and only about thirty imposed the disciplines and limitations of adaptation to the many shapes (anything up to fifty) required for a full range of tableware and unfortunately none of these is illustrated. But the plates show a catholicity of design curiously in step with their period: Lissim is a *virtuoso* rather than *avant garde*. The gorgeous 'large platter' in gold, red, white and black, made in 1928, is clearly a beautiful, rich and formal piece contrasting strangely with another platter decorated with not very beautiful fish rather painfully

squeezed into the shape of the dish. The coffee cup and saucer combine superb shapes with a geometrical design related, no doubt, to the rather self-conscious cubist pipes but so well matured as to be timeless in quality. So also the cigarette holders; the Russian influence is strong here but the designs and shapes have an individual strength that is as acceptable now—and neither more nor less 'modern'—as when the pieces were designed 18 years ago.

On the other hand some of the vases seem to be pure 1920 to 1930 stuff and if they have merit in terms of shape or design the illustrations do them less than justice. By contrast there is a plate in gold and dark brown on white that holds great excitement. It is roughly circular with an eliptical rim and a free yet formal design. This is the most original piece in the book but we are not told how the pattern is applied.

Most of the pieces shown are flat wear, but there are one or two interesting holloware examples including a bowl whose delightfully clean and sweeping shape seems to sacrifice some of its pleasure to the uneven line in the decoration just below the rim. But in shapes and decoration alike Lissim has eschewed any tendency towards bogus 'contemporaryism'. Fashions, as well as much more profound things, have had their influence but every attempt has the hallmark of honesty; one has the feeling that if Simon Lissim walked up any road that appealed to him he would *arrive*, come what may, or if the road did not after all lead anywhere, he would come back undaunted. But he is no meanderer.

ALAN EDEN-GREEN

SHORT NOTES ON OTHER BOOKS

CURSIVE HANDWRITING. *By Philip A. Burgoyne. Dryad Press*, 1955. 9*s* 6*d*

Cursive Handwriting presents to teachers and senior students an approach to handwriting as a craft. There are examples of how writing and drawing can be used together in the making of manuscript pages. Two charts illustrate the pedigree of writing and the treatment of illustrations, and there are examples of individual letters and of page arrangement.

THE CHARM OF INDO-ISLAMIC ARCHITECTURE. *By John Terry. Tiranti*, 1955. 15*s*

A period of 600 years, from the thirteenth to the early nineteenth century, is covered by the development of Islamic architecture in India. Much of this time was taken up by the difficulty of achieving a synthesis between the ideas of the Muslim patron, and the Hindu building craftsman, whose hereditary occupation was carried out on lines often diametrically opposed to Islamic theories of building. The book contains 61 photographic plates.

A CONCISE DICTIONARY OF ENGLISH SLANG. *By William Freeman. English Universities Press*, 1956. 8*s* 6*d*

Everyday phrases and idioms are here collected and briefly explained. The origin is stated, where possible, and an example supplied, though the scope of the book permits of only an indication of the various divisions into which slang falls.

FROM THE JOURNAL OF 1856

VOLUME IV. *25th April*, 1856

PROCEEDINGS OF INSTITUTIONS

SALFORD.—On Friday evening, the 11th inst., the pupils of the Mechanics' Institution Day and Evening Schools were publicly examined, and a distribution of prizes took place, for which the necessary funds had been provided by Mr. E. R.

Langworthy, the president, who occupied the chair on this occasion. On the platform with him were Mr. D. Chadwick, the treasurer, and Mr. Urquhart, the hon. sec. There were also on the platform about 70 boys, and between 20 and 30 girls, the subjects for examination. They were selected from the day schools, in which there are 100 boys and 30 girls, and from the evening classes, which are thus attended: Writing, 73; arithmetic, 74; grammar, 67; drawing, 6; French, 6; mathematics, 8; singing, 6; writing, &c. (female), 25. Mr. John Angell, the master of the boys' school, commenced the examination with a lesson on social economy, in which each question and answer formed a distinct logical step in the chain of reasoning proving a given proposition. The girls were then examined in geography and grammar, by their teacher, Miss Agnes Miller, and in arithmetic, by Mr. Chadwick. Mr. Angell further examined his boys in fractional arithmetic and grammatical analysis; and the examination concluded with a lesson on human physiology, conducted by means of a human skeleton and diagrams. The examination throughout was most satisfactory, and the intelligence and readiness of the replies elicited much approbation. The prizes were then distributed to the more deserving pupils, of whom the following is a list: Day Schools—John Corns, William Bogg, Thomas Rowlands, James Ashton, Francis Henstock, George E. Tunncliffe; Miss Tickell, Miss E. Gilman, and Miss Brassington. Evening Classes—Grammar, John Roberts; George Teasdale; drawing, James Hamer and Alexander Braid; arithmetic, James Shephard and William Parker; writing, Richard Hulme and Thomas Foster; music, John Royle; female class, Miss Bell, Miss E. Robinson, and Miss F. Gill. A vote of thanks to the president terminated the proceedings. The directors, it is understood, entertain hopes of some of the pupils competing at the Society of Arts' examinations in June next; and are, it is said, prepared to contribute towards the expenses of deserving candidates.

Some Activities of Other Societies and Organizations

MEETINGS

MON. 30 APR. Geographical Society, Royal, South Kensington, S.W.7. 8.30 p.m. Sir Gavin de Beer: *Alps and Elephants.*

TUES. 1 MAY. Electrical Engineers, Institution of, Savoy Place, W.C.2. 5.30 p.m. *Methods of Fault Detection and Location in Impulse Tests on Transformers* (Discussion).

Incorporated Plant Engineers, at the Royal Society of Arts, W.C.2. 7 p.m. N. Tinwell: *Repairs of Cracked Castings—the Modern Methods.*

Japan Society of London, at the Victoria & Albert Museum, South Kensington, S.W.7. 5.30 p.m. Ko Miyake: *Japan—Tradition and Transformation.*

Manchester Geographical Society, 16 St. Mary's Parsonage, Manchester, 3. 6.30 p.m. T. Burton Brown: *Recent Visit to Turkey.*

WED. 2 MAY. Engineers, Junior Institution of, at the James Watt Memorial Institute, Great Charles Street, Birmingham. 7 p.m. John A. Sargrove: *Electronic Control—the New Power in Industry.*

THURS. 3 MAY. Anthropological Institute, Royal, 21 Bedford Square, W.C.1. 5.30 p.m. R. E. Bradbury: *Ugie-Ovia: a Cult Festival in a Benin Village.*

Refrigeration, Institute of, at the Institution of Mechanical Engineers, 1 Birdcage Walk, S.W.1. 5.30 p.m. D. B. Smith: *The use of Radioactive Techniques in Refrigeration Engineering.*

FRI. 4 MAY. Mechanical Engineers, Institution of, 1 Birdcage Walk, S.W.1. 5.30 p.m. (1) S. P. Hutton: *Three Dimensional Motion in Axial Flow Impellers.* (2) E. A. Spencer: *The Performance of an Axial Flow Pump.*

MON. 7 MAY. Engineers, Society of, at the Geological Society, Burlington House, Piccadilly, W.1. 5.30 p.m. D. F. Brice: *Oil-fired Packaged Portable Boilers.*

TUES. 8 MAY. Electrical Engineers, Institution of, Savoy Place, W.C.2. 5.30 p.m. J. Bell: *Ship Stabilization: Automatic Controls, Computed and in Practice.*

WED. 9 MAY. Electrical Engineers, Institution of, Savoy Place, W.C.2. 5.30 p.m. L. R. F. Harris: *Time Sharing as a Basis for Electronic Telephone Switching: A Switched Highways System.*

FRI. 11 MAY. Mechanical Engineers, Institution of, 1 Birdcage Walk, S.W.1. 5.30 p.m. R. R. Whyte: *The Influence of the Gas Turbine Axial Flow Aero Engine on Blade Manufacturing Methods.*

OTHER ACTIVITIES

MON. 30 APR. UNTIL SUN. 6 MAY. Imperial Institute, South Kensington, S.W.7. 12.30 p.m., 1.15 p.m. and 3 p.m. Weekdays, 3 p.m. and 4 p.m. Saturdays, 3 p.m., 4 p.m. and 5 p.m. Sundays. Films: *Oil in Pakistan; Rhodesia Spotlight No. 30; Flying Surveyor—Canada.*

MON. 7 MAY UNTIL SUN. 13 MAY. Imperial Institute, South Kensington, S.W.7. 12.30 p.m., 1.15 p.m. and 3 p.m. Weekdays, 3 p.m. and 4 p.m. Saturdays, 3 p.m., 4 p.m. and 5 p.m. Sundays: Films: *Bhopal—India; Land of Zinj—East Africa.*

NOW UNTIL 18 MAY. Wood Engravers, Society of, at The Crafts Centre of Great Britain, 16–17 Hay Hill, W.1. *Exhibition of Wood Engravings and Colour Prints.*

NOW UNTIL 26 MAY. Contemporary Arts, Institute of, 17–18 Dover Street, W.1. Exhibition: *Roberto Burle Marx: Brazilian Landscape and Garden Design.*

NOW UNTIL 30 MAY. Imperial Institute, South Kensington, S.W.7. Exhibition of Current Issues: *Commonwealth Postage Stamps.*